

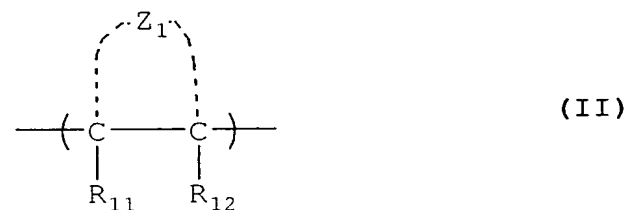
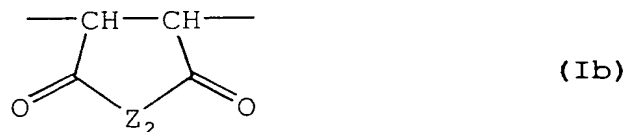
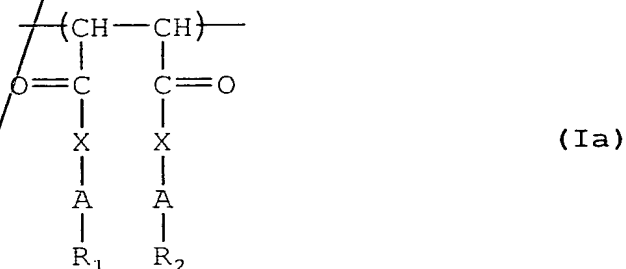
WHAT IS CLAIMED IS:

1. A positive photoresist composition for far ultraviolet exposure, comprising:

(A) a compound capable of generating an acid by the irradiation of an actinic ray or radiation,

(B) a polymer having at least either a repeating unit represented by the following formula (Ia) or a repeating unit represented by the following formula (Ib) and a repeating unit represented by the following formula (II) and having a group capable of decomposing by the action of an acid, and

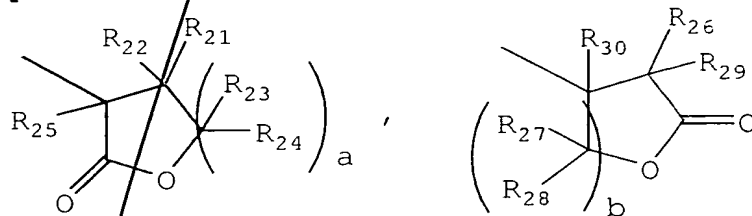
(C) a compound capable of decomposing by the action of an acid to generate a sulfonic acid:



wherein

in formula (Ia), R_1 and R_2 each independently represents hydrogen atom, a cyano group, a hydroxyl group, $-COOH$, $-COOR_5$, $-CO-NH-R_6$, $-CO-NH-SO_2-R_6$ (wherein R_5 represents an alkyl group which may have a substituent, a cyclic hydrocarbon group which may have a substituent or a $-Y$ group shown below, and R_6 represents an alkyl group which may have a substituent or a cyclic hydrocarbon group which may have a substituent), an alkyl group which may be substituted, an alkoxy group which may be substituted, a cyclic hydrocarbon group which may be substituted or a $-Y$ group shown below, X represents oxygen atom, sulfur atom, $-NH-$, $-NHSO_2-$ or $-NHSO_2NH-$, and A represents a single bond or a divalent linking group:

$-Y$ group:



(wherein R_{21} to R_{30} each independently represents hydrogen atom or an alkyl group which may have a substituent, and a and b each represents 1 or 2);

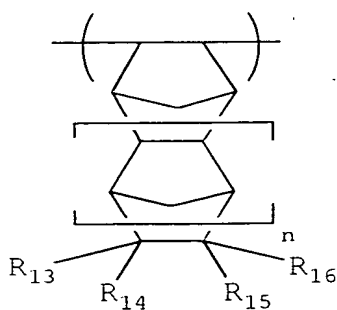
in formula (Ib), Z_2 represents $-O-$ or $-N(R_3)-$ (wherein R_3 represents hydrogen atom, a hydroxyl group or $-OSO_2-R_4$ (wherein R_4 represents an alkyl group, a haloalkyl group, a

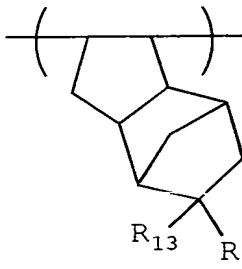
cycloalkyl group or a camphor residue)); and

in formula (II), R_{11} and R_{12} each independently represents hydrogen atom, a cyano group, a halogen atom or an alkyl group which may have a substituent, and Z_1 represents an atomic group necessary for forming an alicyclic structure which contains two bonded carbon atoms (C-C) and may have a substituent.

2. The positive photoresist composition for far ultraviolet exposure as claimed in claim 1, wherein Z_1 in formula (II) represents an atomic group necessary for forming a bridged alicyclic structure which contains two bonded carbon atoms (C-C) and may have a substituent.

3. The positive photoresist composition for far ultraviolet exposure as claimed in claim 1, wherein the repeating unit represented by formula (II) is that represented by the following formula (II-A) or (II-B):





(II-B)

wherein R_{13} to R_{16} each independently represents hydrogen atom, a halogen atom, a cyano group, $-COOH$, $-COOR_5$ (wherein R_5 is the same as defined above), a group capable of decomposing by the action of an acid, $-C(=O)-X-A-R_{17}$ (wherein X and A are the same as defined above, and R_{17} represents $-COOH$, $-COOR_5$, $-CN$, a hydroxyl group, an alkoxy group which may have a substituent, $-CO-NH-R_6$, $-CO-NH-SO_2-R_6$ (wherein R_5 and R_6 are the same as defined above) or a $-Y$ group shown above), an alkyl group which may have a substituent or a cyclic hydrocarbon group which may have a substituent, at least two of R_{13} to R_{16} may be combined to form a ring, and n represents 0 or 1.

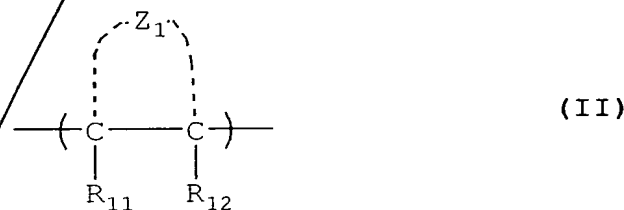
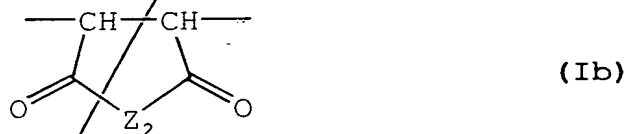
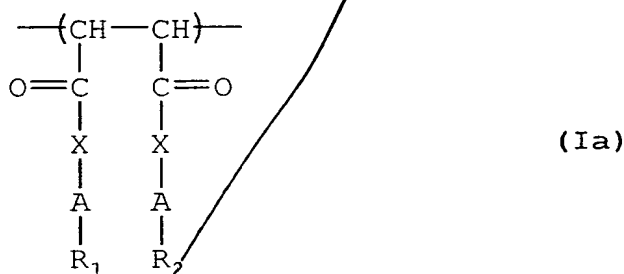
4. A positive photoresist composition for far ultraviolet exposure, comprising:

(A) a compound capable of generating an acid by the irradiation of an actinic ray or radiation,

(B) a polymer having at least either a repeating unit represented by the following formula (Ia) or a repeating unit represented by the following formula (Ib) and a repeating unit represented by the following formula (II)

and having a group capable of decomposing by the action of an acid, and

(D) a fluorine-type and/or silicon-type surface active agent:

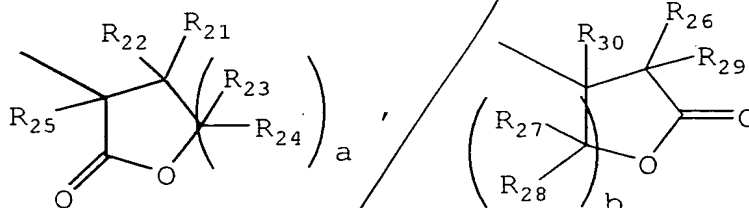


wherein

in formula (Ia), R_1 and R_2 each independently represents hydrogen atom, a cyano group, a hydroxyl group, $-\text{COOH}$, $-\text{COOR}_5$, $-\text{CO-NH-R}_6$, $-\text{CO-NH-SO}_2-\text{R}_6$ (wherein R_5 represents an alkyl group which may have a substituent, a cyclic hydrocarbon group which may have a substituent or a $-\text{Y}$ group shown below, and R_6 represents an alkyl group which may have a substituent or a cyclic hydrocarbon group which may have a substituent), an alkyl group which may be

substituted, an alkoxy group which may be substituted, a cyclic hydrocarbon group which may be substituted or a -Y group shown below, X represents oxygen atom, sulfur atom, -NH-, -NHSO₂- or -NHSO₂NH-, and A represents a single bond or a divalent linking group:

-Y group:



(wherein R₂₁ to R₃₀ each independently represents hydrogen atom or an alkyl group which may have a substituent, and a and b each represents 1 or 2);

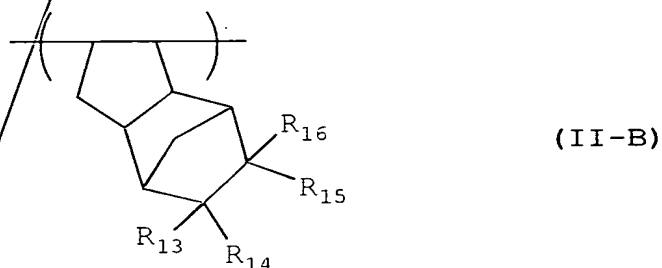
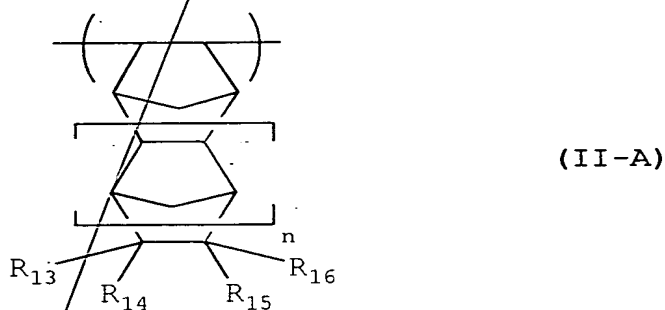
in formula (Ib), Z₂ represents -O- or -N(R₃)- (wherein R₃ represents hydrogen atom, a hydroxyl group or -OSO₂-R₄ (wherein R₄ represents an alkyl group, a haloalkyl group, a cycloalkyl group or a camphor residue)); and

in formula (II), R₁₁ and R₁₂ each independently represents hydrogen atom, a cyano group, a halogen atom or an alkyl group which may have a substituent, and Z₁ represents an atomic group necessary for forming an alicyclic structure which contains two bonded carbon atoms (C-C) and may have a substituent.

5. The positive photoresist composition for far ultraviolet exposure as claimed in claim 4, wherein Z₁ in

formula (II) represents an atomic group necessary for forming a bridged alicyclic structure which contains two bonded carbon atoms (C-C) and may have a substituent.

6. The positive photoresist composition for far ultraviolet exposure as claimed in claim 4, wherein the repeating unit represented by formula (II) is that represented by the following formula (II-A) or (II-B):



wherein R_{13} to R_{16} each independently represents hydrogen atom, a halogen atom, a cyano group, $-\text{COOH}$, $-\text{COOR}_5$ (wherein R_5 is the same as defined above), a group capable of decomposing by the action of an acid, $-\text{C}(=\text{O})-\text{X}-\text{A}-\text{R}_{17}$ (wherein X and A are the same as defined above, and R_{17} represents $-\text{COOH}$, $-\text{COOR}_5$, $-\text{CN}$, a hydroxyl group, an alkoxy group which may have a substituent, $-\text{CO}-\text{NH}-\text{R}_6$, $-\text{CO}-\text{NH}-\text{SO}_2-\text{R}_6$

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(wherein R_5 and R_6 are the same as defined above) or a -Y group shown above), an alkyl group which may have a substituent or a cyclic hydrocarbon group which may have a substituent, at least two of R_{13} to R_{16} may be combined to form a ring, and n represents 0 or 1.

7. The positive photoresist composition for far ultraviolet exposure as claimed in claim 4, which contains a nitrogen-containing basic compound.

8. The positive photoresist composition for far ultraviolet exposure as claimed in claim 7, wherein the nitrogen containing basic compound is at least one compound selected from the group consisting of 1,5-diazabicyclo[4.3.0]-5-none, 1,8-diazabicyclo[5.4.0]-7-undecene, 1,4-diazabicyclo[2.2.2]octane, 4-dimethylaminopyridine, hexamethylenetetramine, 4,4-dimethylimidazoline, pyrroles, pyrazoles, imidazoles, pyridazines, pyrimidines, tertiary morpholines and hindered amines having a hindered piperidine skeleton.

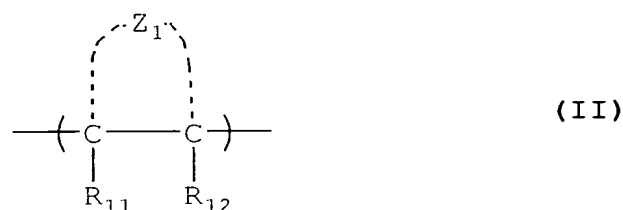
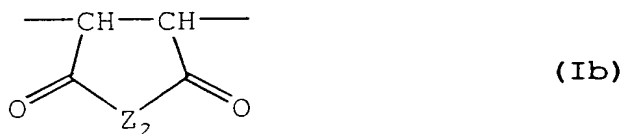
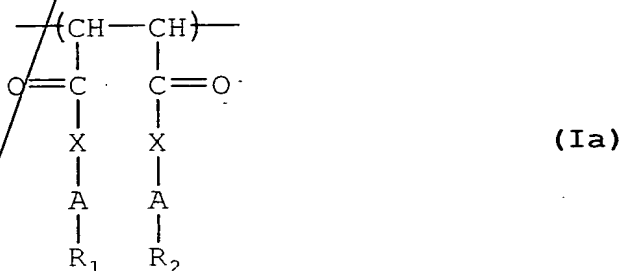
9. A positive photoresist composition for far ultraviolet exposure, comprising:

(A) a compound capable of generating an acid by the irradiation of an actinic ray or radiation,

(B) a polymer having at least either a repeating unit represented by the following formula (Ia) or a repeating unit represented by the following formula (Ib) and a

repeating unit represented by the following formula (II) and having a group capable of decomposing by the action of an acid, and

(E) a mixed solvent containing at least one selected from the group consisting of butyl acetate and propylene glycol monoalkyl ether carboxylate and at least one selected from the group consisting of ethyl lactate and propylene glycol monoalkyl ether:

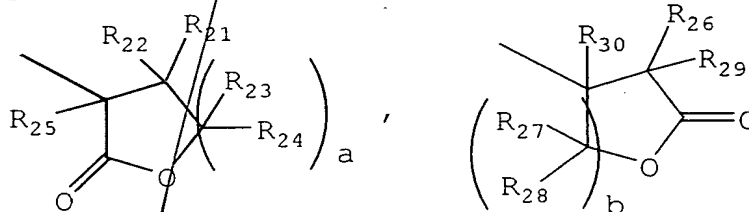


wherein

in formula (Ia), R_1 and R_2 each independently represents hydrogen atom, a cyano group, a hydroxyl group, $-\text{COOH}$, $-\text{COOR}_5$, $-\text{CO-NH-R}_6$, $-\text{CO-NH-SO}_2\text{-R}_6$ (wherein R_5 represents an alkyl group which may have a substituent, a

cyclic hydrocarbon group which may have a substituent or a
 -Y group shown below, and R₆ represents an alkyl group which
 may have a substituent or a cyclic hydrocarbon group which
 may have a substituent), an alkyl group which may be
 substituted, an alkoxy group which may be substituted, a
 cyclic hydrocarbon group which may be substituted or a -Y
 group shown below, X represents oxygen atom, sulfur atom,
 -NH-, -NHSO₂- or -NHSO₂NH-, and A represents a single bond
 or a divalent linking group:

-Y group:



(wherein R₂₁ to R₃₀ each independently represents hydrogen
 atom or an alkyl group which may have a substituent, and a
 and b each represents 1 or 2);

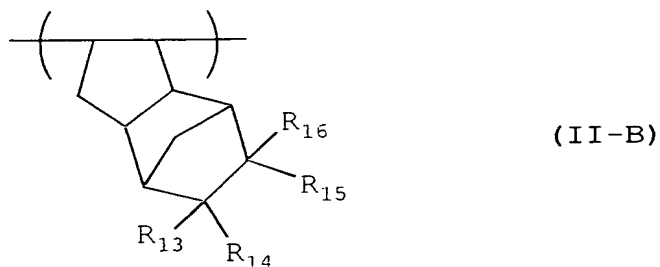
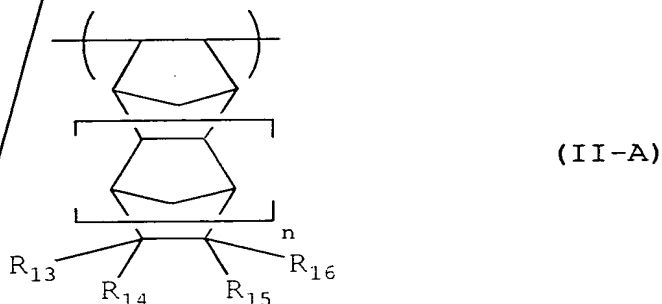
in formula (Ib), Z₂ represents -O- or -N(R₃)- (wherein
 R₃ represents hydrogen atom, a hydroxyl group or -OSO₂-R₄
 (wherein R₄ represents an alkyl group, a haloalkyl group, a
 cycloalkyl group or a camphor residue)); and

in formula (II), R₁₁ and R₁₂ each independently
 represents hydrogen atom, a cyano group, a halogen atom or
 an alkyl group which may have a substituent, and Z₁
 represents an atomic group necessary for forming an

alicyclic structure which contains the two bonded carbon atoms (C-C) and may have a substituent.

10. The positive photoresist composition for far ultraviolet exposure as claimed in claim 9, wherein Z_1 in formula (II) represents an atomic group necessary for forming a bridged alicyclic structure which contains two bonded carbon atoms (C-C) and may have a substituent.

11. The positive photoresist composition for far ultraviolet exposure as claimed in claim 9, wherein the repeating unit represented by formula (II) is that represented by the following formula (II-A) or (II-B):



wherein R_{13} to R_{16} each independently represents hydrogen atom, a halogen atom, a cyano group, $-COOH$, $-COOR_5$ (wherein R_5 is the same as defined above), a group capable of

decomposing by the action of an acid, $-C(=O)-X-A-R_{17}$ (wherein X and A are the same as defined above, and R_{17} represents $-COOH$, $-COOR_5$, $-CN$, a hydroxyl group, an alkoxy group which may have a substituent, $-CO-NH-R_6$, $-CO-NH-SO_2-R_6$ (wherein R_5 and R_6 are the same as defined above) or a $-Y$ group shown above), an alkyl group which may have a substituent or a cyclic hydrocarbon group which may have a substituent, at least two of R_{13} to R_{16} may be combined to form a ring, and n represents 0 or 1.

12. The positive photoresist composition for far ultraviolet exposure as claimed in claim 9, which contains a nitrogen-containing basic compound.

13. The positive photoresist composition for far ultraviolet exposure as claimed in claim 12, wherein the nitrogen containing basic compound is at least one compound selected from the group consisting of 1,5-diazabicyclo[4.3.0]-5-none, 1,8-diazabicyclo[5.4.0]-7-undecene, 1,4-diazabicyclo[2.2.2]octane, 4-dimethylamino-pyridine, hexamethylenetetramine, 4,4-dimethylimidazoline, pyrroles, pyrazoles, imidazoles, pyridazines, pyrimidines, tertiary morpholines and hindered amines having a hindered piperidine skeleton.

14. The positive photoresist composition as claimed in claim 9, wherein the mixed solvent (E) additionally contains at least one solvent selected from the group

consisting of γ -butyrolactone, ethylene carbonate and propylene carbonate.

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